# BLOOD-LETTING.

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UNLESS it be the use of heat and cold, no therapeutic measure antedates blood-letting. It had certainly become firmly established long before Hippocrates, 460 B.C.

As to the persistency of its use, history shows it to have been constant throughout the ages. At times looked upon of as almost as vital importance in disease prevention and disease cure as is food to vital sustenance, in other ages it fell into disuse and was almost entirely abandoned, as being without merit. In the earlier part of the nineteenth century its popularity again increased, and it was held in high regard.

A study of the history of its use shows such lack of accuracy of medical knowledge as, in the slow and retarded development of the evolution of the science of medicine, was the history of the day.

Why has blood-letting lived? It has lived because so many men of the first rank in medicine have pronounced it meritorious and efficacious. Its merits must indeed be great or surely the lack of reason and judgment in its use which its history shows, must have killed it.

From the acme of foolish extreme in its practise, to its almost total abandonment, it has come to-day to be extolled by the leaders in medicine as of the greatest value when properly employed.

The objects of blood-letting are: to bring about a change in the quantity of blood in the vascular system, generally or locally, to change its relative constituents, and to change its activity in the performance of its physiological functions. The usual

object in blood-letting is the reduction of the pressure of the blood in the blood vessels.

The pressure within the vessels when reduced does not remain so, but is promptly reëstablished by the inflow of lymph from the tissues, and at the same time the caliber of the vessels is lessened by the action of the vasomotor nerves. When the vessels are changed by hardening, and consequent loss of elasticity, as in arterio-sclerosis, the return to high pressure is long retarded.

When continued high pressure indicates that reduction of the blood pressure was wise, it is well to remember that the old removed blood is going to be replaced as promptly as possible in the respective subjects by newly made blood of increased functional value. In a subject of fair functional powers not many hours are required for the attaining of full regeneration.

About one half of the blood of the human body must be lost to cause death, and the loss of one fourth is, as a rule, promptly recovered from. It is impossible to empty all the blood from the body, as with the removal of one half the heart ceases to beat and the balance of the blood, ceasing to flow, coagulates in the vessels. Cerebral starvation always causes convulsions before death in bleeding.

Loss of considerable quantities of blood reduces the number of red cells and so the power of $CO_2$ elimination. Accumulation of $CO_2$ depresses the vagus center and so retards and weakens the heart, which in turn causes cerebral anæmia. If the loss of blood be continued beyond one half death results.

According to the statement of Heinrich Stern it has not been shown by investigation whether or not it is possible to direct blood to the brain by position of the body after half the blood has been lost. If the lost blood is replaced by normal salt solution, thus reëstablishing volume, cerebral anæmia and death will be averted.

It is of interest to note that in all latitudes and longitudes, in all altitudes, in all climates and temperatures, in all modes

of living, the blood of the human body is the same in quantity, quality, and function.

It must be remembered that all the metabolic processes of the body are carried on by the blood. Also that back into the blood flow all the surplus and all the products of metabolic and catabolic activities. From this fact it is seen that every breach of normal metabolism must show in the blood and also that vitiated blood must mean vitiated metabolism.

In certain pathological states large amounts of such metabolic and catabolic substances are found in the blood, and this must be a subject for consideration in blood-letting.

No more certain and effective, no more easily controlled physical remedy exists than blood-letting. When the indications for it are positive, if properly performed as to the amount removed, etc., it cannot fail. Blood-letting is the most rational and direct treatment in disturbed osmotic equilibrium, suspended transudation of blood plasma through the vessel walls, capillary sluggishness or arrested movement of the lymph from the tissues to the veins.

It should be remembered that the red cells generated after blood-letting possess greater power of resistance than the red cells removed by venesection, and that with each subsequent venesection the power of resistance grows stronger. It is also true that more blood cells are formed after blood-letting than were removed by the operation.

After venesection the coagulating property of the blood is increased, at least in the vascular area affected by the loss of blood the first concentration occurs, speedily followed by dilution beyond the original. This dilution is due to the absorption of lymph from the tissue and with it is taken in, the substance which causes clotting.

In reducing blood pressure venesection produces a more lasting effect than do the nitrites, electricity, or hot air. By venesection, with associated infusion of normal salt solution the viscosity and the percentage of albumen in the blood are reduced.

By bloodless blood-letting is meant a mechanical treatment by means of which the blood is accumulated in certain parts of the body and detained there for such period as may seem desirable, in this manner depleting during that time the other parts of the body. It has been named phlebostasis and is brought about by placing such restrictions about certain parts as permit ingress through the arterial system and prevent egress through the venous system. We have examples in the placing elastic constrictions about the limbs at their junction with the torso to bloodlessly bleed from the latter, and in producing local partial vacuums by cupping.

The efficiency of this treatment is so patent that the infrequency of its use is an uncomplimentary reflection, showing the proneness of the mass of the members of our profession to seldom go beyond the confines of the therapeutic agents which are most used and which require of them but little mental effort in the selection or in application.

By the exclusion of the limbs from the torso the field of the labor for the heart is reduced and it is given an opportunity by partial rest to rally. The longer the blood is confined to the limbs the less will be the interchange of gases between the retained blood and the tissue it drains and also between the retained blood and the general circulation. By repetition of this method increased arterialization is secured. Disturbances of cardiac compensation, dyspnœa, and like obstruction to normal circulation are promptly relieved.

A treatment for circulatory adjustment by this method may last for days, giving increased chance for repair. Dyspnœa is at once relieved in most cases for hours. By this method of relieving dyspnœa, diagnosis as to the cause possibly resting with the breach of compensation is made evident.

While discussing this subdivision of my subject—bloodless blood-letting—dry cupping must be recognized at its full value. This is only appreciated by those who by the familiarity of long usage have grown to know its full worth. Perhaps no one can

speak with such commendation of dry cupping as he who has experienced personal relief from pleurisy or from that expression of myelitis, lumbago, by the use of dry cups.

The relief is immediate, and lasts for some time, often being followed by complete cessation of pain and restoration to health. This bloodless treatment is more efficacious than morphia, which deadens the pain but does not cure, and, of course, it has none of the ill effects of that narcotic drug.

The short time limit permitted for the reading of papers in this society makes impossible the giving the details of applicability of the various forms of bloodless treatment and blood-letting procedures. Blood-letting is perhaps accomplished more frequently and by more physicians by means of leeches than by any other method. This is particularly true in ophthalmology, in extravasation from trauma, and in all anal inflammations.

A leech weighs from thirty to fifty grains and extracts about three times its weight in blood. The after bleeding from leech bites is said by Weil to be caused by a substance which it secretes impeding coagulation. As a passing note of interest, it is said that a leech may be made to loosen its hold by sprinkling salt on its tail. Fresh blood will not coagulate if leeches are placed in it.

We will now consider the major expression of blood-letting, namely, phlebotomy or venesection. This operation usually deals with the entire blood circulation of the body. Details of the methods of doing venesection are sufficiently well known to permit of their being omitted. If vein incision by small bistoury is the method employed, the cut should be crucial so as to cut both the longitudinal and the circulatory fibers.

Puncturing the compressed vein with a trocar is a much neater and cleaner method. By this means the skin wound is reduced to a minimum and the course of the flow of blood is more easily directed to the intended receptacle.

A short word about blood-letting in special diseases will complete my paper. It will be remembered that the work of the

heart is lessened by the reduction of the volume of blood and that it is further lessened by the blood being made thinner. It will relieve back pressure, as it were, causing lymph stasis and so will accelerate metabolism. After depletion excess fluids in parts, as in the lungs for example, are first taken up. Contained poisonous substances are at once removed, often saving life, as their toxic action during the long delay required if the stimulation of the normal secretory organs is depended upon for their removal is thus prevented. Blood-letting stimulates the blood-making organs especially the bone marrow.

It is essential that the heart should be supported by the maintenance of a sufficient volume of blood when there has been a removal of large quantities either purposely or by accident. The injection of normal salt solution is, of course, the method of choice.

Under the caption of blood-letting as applied to respective diseases in which it has been used, the first here to be considered is pneumonia.

## Pneumonia.

In the blood-letting treatment of this disease, perhaps more than in any other, there have arisen enthusiastic adherents and bitter opponents apparently unwilling to be convinced by any showing, history, or opinion.

Blood-letting does not influence the lung inflammation, but it does remove the venous engorgement in the lesser circulation and so prevents edema. The heart is relieved of the embarrassment of the overfilled blood vessels carrying blue blood and of pulmonary edema. In this connection dry cupping and bloodless blood-letting by the other enumerated methods must be kept in mind.

The physician who feels that an excess quantity of blood to the extent of fatiguing the heart is present, and that the existing composition should be changed is the advocate of blood-letting in pneumonia, at times, of course, associated with intravenous introduction of normal salt solution. As soon as dyspnœa or

cyanosis develops the time has arrived for blood-letting; the relief is immediate.

When the inspiration of oxygen and the expiration of carbon dioxide are mechanically interfered with by the compression of the capillaries, when the pulmonary vesicles are choked and there is present some edema, blood-letting, in the opinion of a majority of the leading men of medicine to-day, is the treatment to be chosen. Relieve the heart of overwork and often the life of the patient will thus be saved. Saline infusion will thin the blood and so reduce the force of the heart contraction which is necessary to maintain proper circulation. Of course, a portion of the volume of blood may first be removed from the already over-engorged venous side of the pulmonary circulation by wet cupping or far better by phlebotomy, venesection, or phlebostasis.

Bleeding *will* relieve an over-distended right heart; drugs and other therapeutic measures may do so. The action of a mustard plaster is in its effects simply a bloodless blood-letting of the part adjacent to that to which it is applied, plus a reflex nerve action from irritation.

The whole story of Bier's induced hyperemia is but the story of bloodless blood-letting. Osler, Tyson, Anders, and Daland are among those who advocate the use of bleeding in pneumonia.

Daland notes that the integrity of the heart muscle has been reduced by the toxins of the disease and that thrombus within the right heart occurs when the dilatation is at its maximum, so to prevent clotting venesection should be done early in right-side dilatation. The infusion of normal salt solution may wisely be synchronous with the taking of the blood and so the tendency to clot formation reduced. The blood should be taken rapidly.

## Pleurisy.

Dry and wet cupping are as magical in giving relief to the pain and overcoming the inflammatory process as is the hypodermic of morphia in masking the pain.

### Eclampsia.

Dyspnœa, lividity, and engorgement of the veins should be immediately relieved by blood-letting and normal salt solution.

### Cardiac Asthma.

Cardiac asthma is almost magically relieved by venesection if done at the proper time.

### Atherosclerosis.

Atherosclerosis and aneurysm are most favorably influenced by blood-letting. By this means both the blood itself and the condition of the vessels are improved, rupture of the vessels in the brain prevented and the distressing symptoms of abnormal cerebral circulation removed. After apoplexy it will not injure, but will often be of marked benefit.

Among the many diseases and mal-conditions in which blood-letting has proved beneficial may be enumerated uremia, chronic and acute, puerperal eclampsia, narcomia, chlorosis, epilepsy, migraine psychoses, many eye diseases, plethora, insolation, gas poisoning, acidosis, ulcerations, local inflammations, etc.

Due acknowledgment is made to the writings of Anders, Babcock, Brunton, Campbell, Daland, Jacobi, von Jaksch, Levin, Loomis, North, Osler, Riesman, Stern, Waterman, Weil, Zmke.

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## DISCUSSION.

Dr. Minor: I think all of us recognize the value of blood-letting in certain conditions. The little operation of opening the vein is a very pretty one, but it means dissecting down to the vein and passing ligatures under it—and that too often makes the doctor shy off from doing it—he has gotten a little rusty, and then too the patient looks upon it as an operation. Therefore we know it is not easy to do. Anything that makes an operation easy to perform is good; and I have recently used a 100 c.c. two way cock syringe for this operation. I sterilize the skin and enter the vein with the needle. In this way you know exactly how much blood you are taking out,

can remove as many c.c. as you wish and the patient does not consider it an operation. I would strongly recommend this method to every one who wants to carry out the measure easily and simply. If this method is used bleeding will be done more frequently—and yet I hope it will never become as popular as it was fifty years ago.

In hypertension I am satisfied that occasional bleeding is one of the best methods at our command; and there are many conditions that I need not dwell upon, in which it is of great therapeutic value. All it needs is simplification. This was drawn to my attention recently in the case of a woman with apoplexy. She was so stout that it was very hard to find the blood-vessel at all, and it was necessary to cut through a large area of fat, which made quite a complex procedure of a small operation. Many men are held off from the measure for this very reason.

Dr. MANGES: I want to bear testimony to the value of bloodless phlebotomy in conditions where the rapid reduction of blood pressure is desired—for instance in hæmorrhage from the lung, or from the bowel in typhoid, I know of no more effective therapy than this simple method. Putting the Esmarch bandage on both lower extremities you can see at once what an enormous plug is removed from the circulation by the simplest possible method. I know surgeons who are most enthusiastic advocates of this measure; and I know of nothing better if one wants to get an actual, absolute reduction of blood pressure in a simple and direct way. But my feeling is just the reverse when it is considered from the other standpoint—that of the greater circulation. In high blood pressure patients I have repeatedly had blood-lettings done with the manometer on the arm, and have failed to see the slightest influence on blood pressure, even with large bleedings. You might say that the physiological effect of the blood-letting on the patient more than is shown in the blood pressure readings but when it has been tried repeatedly and the blood pressure taken immediately, and you see it uninfluenced at all by a large bleeding of 12 ounces or more you begin to lose faith in all that blood pressure was going to accomplish. I am no longer enthusiastic about blood-letting in trying to influence high blood pressure and allied conditions. There is only one condition where the greater circulation is involved in which I have seen remarkable results by this method, that is in polycythemia. Here we are dealing with other conditions, with an enormous increase in viscosity, and in the hæmoglobin; the whole volume is increased; the water is increased; so that when you do remove 12 ounces or more in such an individual you are influencing not only the blood volume but also chemical and other conditions.

To come to another point, when I hear of a recommendation of

infusion after a phlebotomy I fail to see what the phlebotomy is accomplishing. Phlebotomy is to reduce blood volume, and if you do an infusion as well, your total volume remains the same. You may say that you are changing the blood composition, but after all the total blood volume you are removing is very small. When it comes to the question of the lesser circulation there we are dealing with a different proposition, and we must not confuse the benefits from this measure with those we are supposed to get from its influence on the greater circulation.

I would close my remarks by referring to one condition in which blood-letting is held up as *the* great remedy—that is in apoplexy. In a very exhaustive discussion of the use of blood-letting in apoplexy, in Von Monakow's treatise he speaks on the subject of venous blood-letting in apoplexy, and ends by saying: "Let me tell you that the apoplectic individual is better off without blood-letting than with it. . . . The blood pressure changes going on within the skull ought not to be tampered with by blood-letting. The increase of tension may be one of the means nature has tried to reduce the bleeding." I simply mention this and refer those who are interested to that elaborate discussion. Enthusiastic as I was some years ago, my enthusiasm has waned and I have gone back to the simple phlebotomy, and to the use of blood-letting in conditions affecting the lesser circulation.

Dr. ELLIOTT: Where the syringe is not available the use of a large broad needle answers perfectly well; in this way in a short time you can get a large amount of blood.

Dr. MINOR: Is there not danger of cutting (?) into the vein by such a method?

Dr. ELLIOTT: No, I do not think so. This procedure is very simple, and the needle can be carried in the pocket and used if the syringe is not available.

Dr. ROBINSON (closing): In regard to the use of a syringe in certain veins, with the diphtheria antitoxin syringe I have never seen any ill effects.

As to the question of relieving heart fag (?) by changing the viscosity of the blood I think there must be less work for the heart.

In regard to the theoretical value of blood-letting when apoplexy threatens, we know the condition before apoplexy obtains; we have seen those symptoms followed by apoplexy, and after we have reduced the volume of blood we have seen these patients given comfort.

They will come to you, say once every three or six months, and insist on having a blood-letting; and I take that as a better test than the theory of what the pressure does in nature's effort to repair within the brain. I usually remove 32 to 40 ounces and never have any trouble at all. This is not much in relation to the whole volume and does no harm.